

REMARKS

Claims 1-8, 16-28, and 37 are pending. Claim 1, 16, 22, and 37 are in independent form.

Rejections under 35 U.S.C. § 103

In the action mailed April 8, 2008, claim 1 was rejected under 35 U.S.C. § 103(a)¹ as obvious over U.S. Patent No. 4,517,280 to Okamoto et al. (hereinafter "Okamoto") and U.S. Patent Publication No. 2003/0091940 to Nakao (hereinafter "Nakao")

Claim 1 relates to a method that includes patterning a substrate with a substantially arbitrary arrangement of features. The patterning includes patterning an array of repeating lines and spaces between the lines in an first photoresist layer and introducing irregularity into an area of the substrate covered by the array of repeating lines and spaces. The irregularity is introduced by forming an arbitrary figure in a second photoresist layer above the array. The arbitrary figure comprises a first feature and a second feature that are noncontiguous and that each bridge one or more of the repeating lines and spaces at different longitudinal positions.

¹ As pointed out in the response filed January 3, 2008. the heading of the rejection indicates that claims 1-7 and 16-20 are rejected under 35 U.S.C. § 102(b) as anticipated by Okamoto and Nakao. In light of the remainder of the Office action, and the acceptance of the January 3, 2008 response, applicant again assumes that this is a typographical informality.

The rejection of claim 1 is based on the contention that:

"Nakao ... in figures 35A, 35B, and 35C, discloses that the patterns transferred to the resist layer from the second photomask [introduce] irregularity such that features (first, second, third etc) that are noncontiguous and in longitudinal positions and bridging the initially formed line and space patterns are formed." See *Office action mailed April 8, 2008*, page 3, line 9-13.

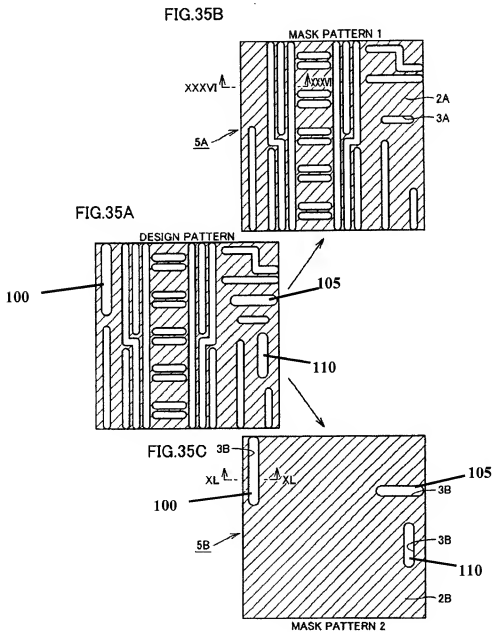
The Office action also contends that Nakao describes patterning a second photoresist layer on an array:

"such that first, second, third, etc., features are formed in different longitudinal positions while bridging the line and space patterns. See figures 35 A through C, the different line and space patterns are bridging the initially formed line and space pattern at different longitudinal positions." See also *id.*, page 8, line 12-18.

Applicant respectfully disagrees. For the sake of convenience, FIGS. 35A, 35B, 35C of Nakao are reproduced below. Please note that reference numerals 100, 105, 110 have been added thereto by applicant and do not appear in Nakao's original FIGS. 35A, 35B, 35C.

According to Nakao, FIGS. 35A, 35B, 35C illustrate the extraction of "fine" and "relatively large" bright line patterns from a single design pattern. See, e.g., Nakao, para. [0041]. In particular, Nakao's photomask 5A (shown in FIG. 35B) is obtained by extracting only fine bright line patterns 3A from the design pattern in FIG. 35A. See, e.g., *id.*, para. [0127].

Nakao's photomask 5B (shown in FIG. 35C) includes the remaining patterns 3B that are extracted from the design pattern in FIG. 35A. *See, e.g., id.*



As discussed in the response filed January 3, 2008, none of the lines in Nakao's fine bright line patterns (shown in FIG. 35B) bridge the lines in Nakao's remainder bright line patterns (shown in FIG. 35C). For example, the "relatively large" line which has been labeled "100" by applicant does not bridge a "fine" line in either of FIGS. 35A, 35C. Similarly, the "relatively large" lines labeled "105" and "110" by applicant do not bridge a "fine" line in either of FIGS. 35A, 35C.

If the Examiner persists in maintaining the rejection, Applicant respectfully requests that the Examiner identify which lines in FIGS. 35A, 35B, 35C are believed to "bridge one or more of ... repeating lines and spaces at different longitudinal positions," as recited in claim 1.

In the absence of such a showing, as discussed in the response filed January 3, 2008, Applicant respectfully submits that nothing in Nakao would lead one of ordinary skill to introduce irregularity into Okamoto's gratings by forming noncontiguous features that each bridge one or more of the repeating lines and spaces of a grating at different longitudinal positions, as recited in claim 1.

Even if Okamoto and Nakao were combined, one of ordinary skill would not arrive at the recited subject matter. Claim 1 is therefore not obvious over Okamoto and Nakao. Accordingly, applicant respectfully requests that the rejections of claims 1 and the claims dependent therefrom be withdrawn.

Claim 16 was rejected under 35 U.S.C. § 103(a) as obvious over Okamoto and Nakao.

Claim 16 relates to a method that includes interfering electromagnetic radiation to illuminate a substrate with an interference pattern, and introducing irregularity into an area on the substrate covered by the repeating lines and spaces to impart an arbitrary feature arrangement to the substrate. The interference pattern imparts a first photoresist layer on the substrate with repeating lines and spaces.

Introducing irregularity comprises forming an arbitrary figure in a second photoresist layer above a portion of the repeating lines and spaces. The arbitrary figure comprises a first feature and a second feature that are noncontiguous and that each bridge one or more of the repeating lines and spaces at different longitudinal positions.

The rejection of claim 16 is understood to be based on the contention that Nakao's FIGS. 35A, 35B, 35C show first and second features that are noncontiguous and that each bridge one or more of the repeating lines and spaces at different longitudinal positions, as recited in claim 16.

Applicant respectfully disagrees. As discussed above, none of the lines in Nakao's fine bright line patterns (shown in FIG. 35B) bridge the lines in Nakao's remainder bright line patterns (shown in FIG. 35C). Accordingly, Applicant respectfully submits that nothing in Nakao would lead one of ordinary skill to introduce irregularity into Okamoto's gratings by forming first and second features that are noncontiguous and that each bridge one or more of the repeating lines and spaces at different longitudinal positions, as recited in claim 16.

Thus, even if Okamoto and Nakao were combined, one of ordinary skill would not arrive at the recited subject matter. Claim 16 is thus not obvious in light of Okamoto and Nakao. Accordingly, applicant respectfully requests that the rejections of claims 16 and the claims dependent therefrom be withdrawn.

Claim 22 was rejected under 35 U.S.C. § 103(a) as obvious over Okamoto, Nakao, and European Patent Application EP 0915384 to Sugita et al. (hereinafter "Sugita").

Claim 22 relates to a method that includes patterning a first layer on substrate using a first lithographic technique, printing, in a photoresist layer using a second lithographic technique providing a second pitch, a first feature to bridge a first collection of one or more of the repeating lines and spaces at a first longitudinal position, a second feature to bridge a second collection of one or more of the repeating lines and spaces at a second longitudinal position, and a third feature to bridge a third collection of one or more of the repeating lines and spaces at a third longitudinal position, and etching the substrate to transfer, to the substrate, a superposition of the lines and spaces with the first feature, the second feature, and the third feature.

The patterning of the first lithographic technique provides lines and spaces in a the first layer with a first pitch yielding a first k_1 factor smaller than or equal to 0.5.

The first feature, the second feature, and the third feature are noncontiguous. The second pitch is two or more times larger than the first pitch. The continuity of at least the first collection, the second collection, and the third collection is broken in the transferred superposition.

The rejection of claim 22 is understood to be based on the contention that Nakao's FIGS. 35A, 35B, 35C show printing first, second, and third features to bridge a first collection of one or more of the repeating lines and spaces at a first, second, and third longitudinal positions, as recited in claim 22.

Applicant respectfully disagrees. As discussed above, none of the lines in Nakao's fine bright line patterns (shown in FIG. 35B) bridge the lines in Nakao's remainder bright line patterns (shown in FIG. 35C). Accordingly, Applicant respectfully submits that nothing in Nakao would lead one of ordinary skill to print first, second, and third features as recited in claim 22.

Thus, even if Okamoto, Nakao, and Sugita were combined, one of ordinary skill would not arrive at the recited subject matter. Claim 22 is thus not obvious in light of Okamoto, Nakao, and Sugita. Accordingly, applicant respectfully requests that the rejections of claims 22 and the claims dependent therefrom be withdrawn.

Claim 37 was rejected under 35 U.S.C. § 103(a) as obvious over Okamoto, Nakao, and Sugita.

Claim 37 relates to a method that includes patterning a first layer of photoresist on a substrate using interference lithography to provide a collection of periodic lines and spaces having a first pitch, patterning a second layer of photoresist using a second lithographic technique to provide an arbitrary feature with a second pitch, and etching the substrate to transfer a superposition of the lines and spaces provided by patterning the first layer and the arbitrary feature provided by patterning the second layer to the substrate. The second pitch is two or more times larger than the first pitch. The arbitrary figure comprises a first feature and a second feature that are noncontiguous and that each bridge one or more of the repeating lines and spaces at different longitudinal positions. The continuity of at least one of the lines and spaces is broken at the different longitudinal positions in the transferred superposition.

The rejection of claim 37 is understood to be based on the contention that Nakao's FIGS. 35A, 35B, 35C show printing first and second features that are noncontiguous and that each bridge one or more of the repeating lines and spaces at different longitudinal positions, as recited in claim 37.

Applicant respectfully disagrees. As discussed above, none of the lines in Nakao's fine bright line patterns (shown in FIG. 35B) bridge the lines in Nakao's remainder bright line patterns (shown in FIG. 35C). Accordingly, Applicant respectfully submits that nothing in Nakao would lead one of ordinary skill to first and second features, as recited in claim 37.

Thus, even if Okamoto, Nakao, and Sugita were combined, one of ordinary skill would not arrive at the recited subject matter. Claim 37 is thus not obvious in light of Okamoto, Nakao, and Sugita. Accordingly, applicant respectfully requests that the rejections of claims 37 and the claims dependent therefrom be withdrawn.

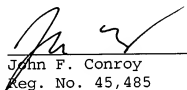
It is believed that all of the pending claims have been addressed. However, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed. Finally, nothing in this paper should be construed as an intent to concede any issue with regard to any claim, except as

specifically stated in this paper, and the amendment of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment.

Applicant asks that all claims be allowed. No fees are believed due at this time. Please apply any charges or credits, to Deposit Account No. 06-1050.

Respectfully submitted,

Date: May 22, 2008



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